



Cholera today

-With animated answers-

Vibrio cholerae, reported cases,
7th pandemic, incidence trend, prevention,
treatment and vaccines

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Vibrio cholerae (1)

- “Cholera is an acute intestinal infection caused by ingestion of food or water contaminated with the bacterium *Vibrio cholerae* 01 or 0139. It has a short incubation period and produces an enterotoxin that causes copious, painless, watery diarrhoea that can quickly lead to severe dehydration and death if treatment is not promptly given. Vomiting also occurs in many patients.
- About 75% of people infected with *V. cholerae* 01 or 0139 do not develop any symptoms and become ill, although the bacterium is present in their faeces for 7-14 days.(WHO)
- When illness does occur, about 80-90% of episodes are of mild or moderate severity and are difficult to distinguish clinically from other types of acute diarrhoea. Less than 20% of ill persons develop typical cholera with signs of moderate or severe dehydration.” (Source: <http://www.who.int/topics/cholera/about/en/>)

Vibrio cholerae (2)

Action for students:

Note the following in your records:

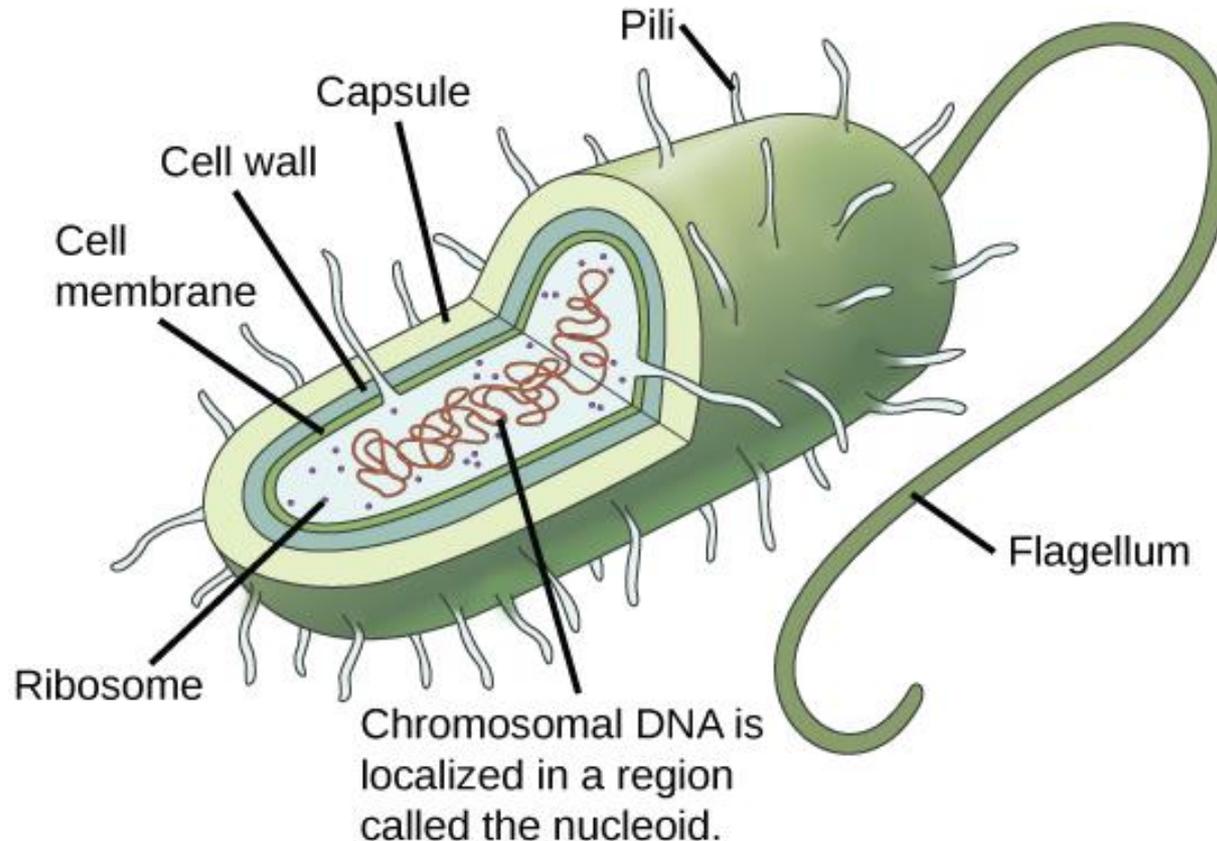
- Name of the disease
- Causative agent
- Incubation period
- Mode of transmission
- Degree of infectiousness
- Symptoms
- Treatment
- Mortality statistics

You may find the previous slide and these sources helpful:

- **WHO**
<http://www.who.int/topics/cholera/about/en/>
- **CDC** <http://www.cdc.gov>
- **Vibrio cholerae powerpoints**
<http://www.bing.com/search?q=Vibrio+cholerae+Columbia+University&src=IE-SearchBox&Form=IE8SRC>
<http://www.pitt.edu/~super1/lecture/lec19901/index.htm>
- Youtube **video** on cholera:
<http://www.youtube.com/watch?v=KPjOMpM8JbE>

Prokaryotic cells diagram

Action for students: Draw and annotate a diagram of a cell.



Prokaryotic cells

Key points

Action for students: What are the **key points** about prokaryotic cells?

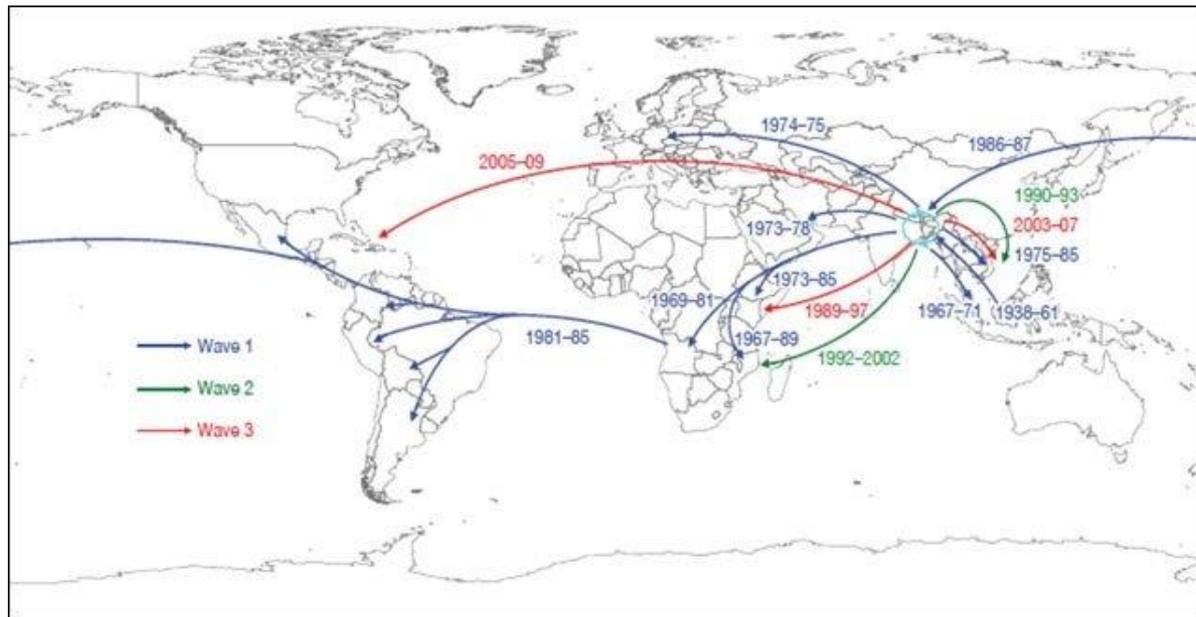
- ✓ “Prokaryotes lack an organized nucleus and other membrane-bound organelles.
- ✓ Prokaryotic DNA is found in a central part of the cell called the nucleoid.
- ✓ The cell wall of a prokaryote acts as an extra layer of protection, helps maintain cell shape, and prevents dehydration.
- ✓ Prokaryotic cell size ranges from 0.1 to 5.0 μm in diameter.
- ✓ The small size of prokaryotes allows quick entry and diffusion of ions and molecules to other parts of the cell while also allowing fast removal of waste products out of the cell.” <https://www.boundless.com/biology/cell-structure/prokaryotic-cells/components-of-prokaryotic-cells/>

More info on prokaryotic cells:

- <http://www.ivy-rose.co.uk/Biology/Cells/Prokaryotic-Cell-Structure.php>

7th pandemic

From a single global source - the Bay of Bengal – a major cholera pandemic has spread in at least three waves. The climate, ecology and large river deltas of the Bay of Bengal could be why it spread from there. Within some marine ecosystems the cholera bacteria exists naturally.

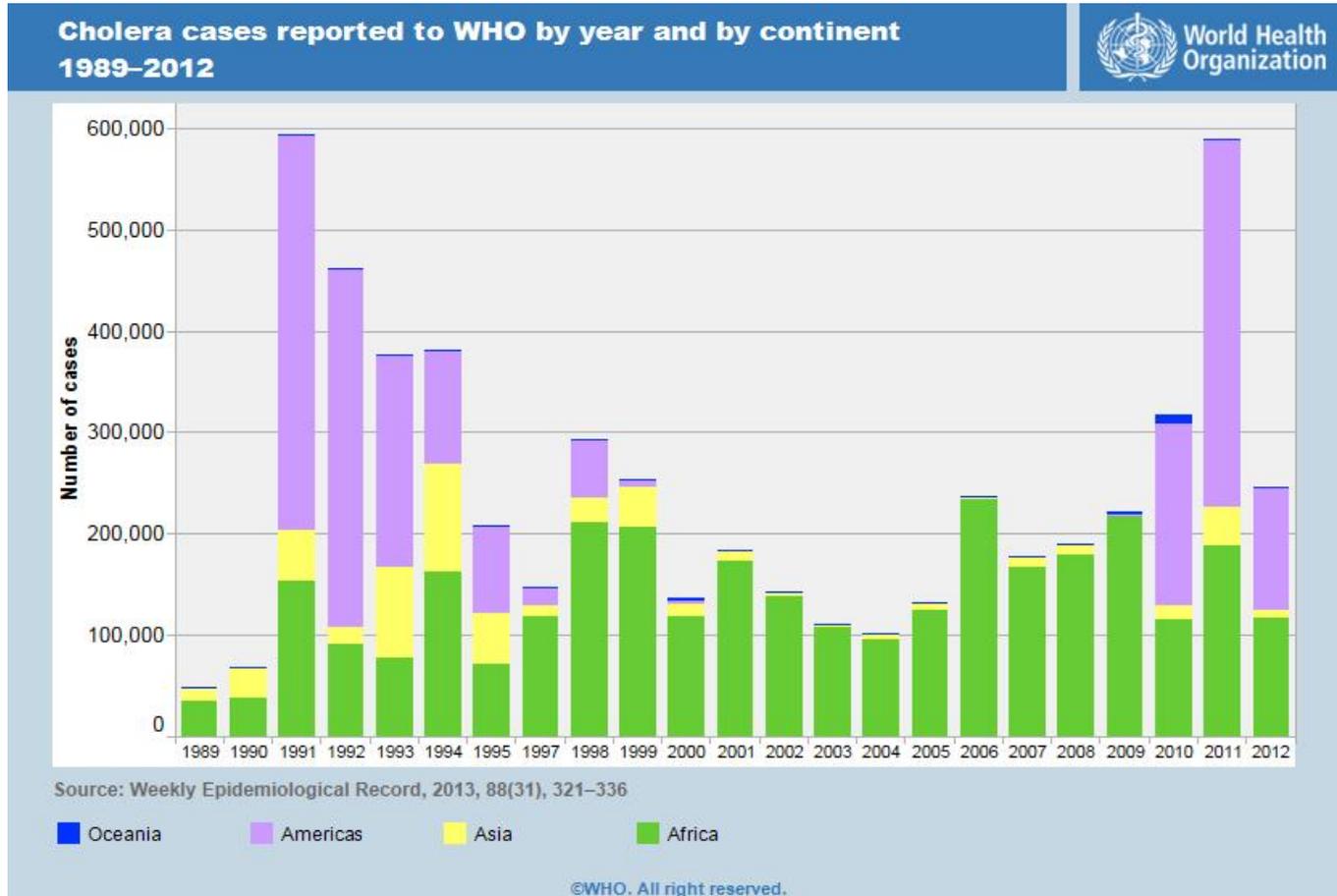


Further info on the 7th pandemic:

- <http://www.cbc.ca/news/technology/cholera-s-seven-pandemics-1.758504>

Source: <http://www.bbc.co.uk/news/health-14664450>

Reported cases



Source: http://www.who.int/gho/epidemic_diseases/cholera/cholera_005.jpg

<http://msf.org.uk/schools-resources>

Incidence trend

Action for students: What is the trend of cholera incidence based on reported cases? When and where is the risk highest?

- ✓ According to the WHO graph, incidence of cholera spiked in 1991 and 2011 – with a notably large increase in the Americas.
- ✓ Steady rise since 2005 with outbreaks affecting several continents, then a drop in 2012. There are severe epidemics in Haiti and several African countries. (See UCLA “Cholera in Haiti and the modern John Snow” http://www.ph.ucla.edu/epi/snow/cholera_haiti.html)
- ✓ **Natural and man-made disasters** such as earthquakes and floods can drive up the risk of cholera. Cholera is a **serious risk in the aftermath of emergencies**, like the Haiti earthquake of 2010, but can strike anywhere. The situation can be **especially problematic in rainy seasons** when houses and latrines flood and contaminated water collects in stagnant pools.
- ✓ Risk can also be high in “**camps for internally displaced population or refugees**, where minimum requirements of clean water and sanitation are not met.” (<http://who.int/features/factfiles/cholera/facts/en/index4.html>)



Photo: Florian Lems

Clean water supply in Uganda helps refugees from the Democratic Republic of Congo. MSF's water and sanitation engineers and logisticians play a vital role in the prevention of cholera.



Reporting and surveillance

Action for students:

Only a small proportion of the **3–5 million cholera cases** in 56 countries and of the **100 000–120 000 deaths attributable to cholera** every year of are reported to the WHO. Suggest reasons why the actual number of cholera cases is much higher than reported?

- ✓ The **actual number is much higher than reported**, because of under reporting, limitations in surveillance systems and inconsistencies in definitions.
- ✓ **Surveillance for prevention, preparedness and early warning are an essential tool** and can help anticipate potential outbreaks. “Surveillance should guide interventions and lead to timely prevention and preparedness activities. When seasonal occurrence can be anticipated, prevention and control must be enhanced and activities such as preparedness plans, training of healthcare staff and pre-positioning of supplies must take place.”(<http://who.int/features/factfiles/cholera/facts/en/index5.html>)

Environmental causes of cholera and response

Action for students: Suggest environmental causes of cholera and how they can be addressed.

- ✓ Outbreaks are usually caused by contaminated water supply, so tend to erupt where food hygiene, sewage treatment and adequate drinking water treatment are either inadequate or non-existent. Unsanitary conditions **increase risk of water and food-borne infections** such as cholera and typhoid. Once there is an outbreak, it is paramount that appropriate treatment and control measures are put in place.
- ✓ Cholera “control depends on far more than the prompt medical treatment of cases.”(WHO) The best means of preventing cholera and other diarrheal diseases are **improvements in water supply, sanitation, food safety and community awareness of preventive measures**. “The **interplay of prevention, preparedness and response** focusing on water safety and proper sanitation, together with an efficient surveillance system are paramount for mitigating outbreaks and diminishing case fatality rates.”
(<http://who.int/features/factfiles/cholera/facts/en/index6.html>)

Cholera is treatable

- Cholera is **treatable**. Administration of **oral rehydration salts (ORS)** to replace lost fluids can successfully treat up to 80% of cases and **intravenous administration of fluids and appropriate antibiotics** can be used to treat severe cases.(WHO)
- Cholera, if left untreated, can kill quickly following the onset of symptoms, so treating patients can save lives and also prevent further outbreaks. The mortality rate of severe cases is between 30-50%.



MSF cholera treatment centres

Action for students: Go to the abstract interactive maps of a cholera treatment centre and find out about disinfections areas; tents for acute hospitalisation, recovery, and observation; supplies and pharmacy; and latrines.

- <http://www.msf.org.uk/cholera>
- <http://ctc.msf.org/home/>



Photo: Nick Owen/MSF

Where are cholera cases endemic today?

Action for students: Where are cholera cases endemic today?

Articles for reference:

- http://www.who.int/gho/epidemic_diseases/cholera/en/
 - http://gamapserver.who.int/gho/interactive_charts/cholera/atlas.html
 - <http://reliefweb.int/report/world/cholera-haiti-africa-and-beyond>
- ✓ Cholera is now **very rare in industrialised countries**, where measures for sanitation, prevention, diagnosis and quarantine are in place. It is endemic and can still cause large numbers of deaths of **people living under poor socio-economic conditions in areas of poor sanitation, crowding and malnutrition.**
- ✓ As was the case in mid-nineteenth century Britain, large-scale migration into urban centres and accompanying growth of urban tenements and **slums in less developed countries can result in living conditions with risk for the spread of cholera** if the organism exists or is introduced into the environment.



MSF cleans wells after floods in the Philippines.



MSF builds latrines for asylum seekers in Brazil.

Oral cholera vaccines

- **Oral cholera vaccines of demonstrated safety and effectiveness** have recently become available for use by individuals and have become part of the cholera control package. Some countries have already used oral cholera vaccines to immunize populations considered to be at high risk for cholera outbreaks.
- Evidence gained on the use of oral **cholera vaccines** is evolving rapidly. Work is under way to investigate the role of mass vaccination especially of vulnerable populations in high-risk areas as a public health strategy for protecting at risk populations against cholera.
- Issues being addressed include logistics, cost, timing, vaccine production capacity, and criteria for use of mass vaccination to contain and prevent outbreaks.” (source <http://www.who.int/topics/cholera/vaccines/en/>)
- There is no country that requires proof of oral cholera vaccination at present. (<http://who.int/features/factfiles/cholera/facts/en/index8.html>)

Oral vaccination programmes

“Oral cholera vaccines have opened up the possibility of preventing outbreaks among the most vulnerable populations living in high risk areas, where usually recommended control measures are not sufficient.”

(<http://www.who.int/cholera/vaccines/en/>)

Further info on cholera vaccines:

- **WHO** <http://www.who.int/topics/cholera/vaccines/en/>
- **Research article** on cholera vaccination programme:
<http://www.plosmedicine.org/article/info%3Adoi%2F10.1371%2Fjournal.pmed.1001512>
- **MSF press release use of oral cholera vaccine** in Guinea
<http://www.doctorswithoutborders.org/press/release.cfm?id=7114&cat=press-release>





South Sudan:

The food insecurity situation in Upper Nile and consequent malnutrition leaves the population more susceptible to cholera.

MSF and cholera

- **MSF** has treated cholera outbreaks in Algeria, Angola, Cameroon, the Democratic Republic of Congo, Haiti, India, Kenya, Nigeria, Pakistan, Papua New Guinea, Somalia, South Sudan, Uganda and Zimbabwe.
- In 2012, **MSF** admitted 57,400 people to cholera treatment centres; in 2013, it admitted 27,900.
- In many situations, **MSF** teams have limited the death rate to less than one percent.

Thank you for using our resource. We would be pleased to receive your feedback. Email: schools@london.msf.org.

Find out more about MSF: <http://www.msf.org.uk>

DOCTORS WITHOUT BORDERS

MEDICOS SIN FRONTERAS

국경 없는 의사회

LÆGER UDEN GRÆNSER

LÄKARE UTAN GRÄNSER

无国界医生

MÉDICOS SEM FRONTEIRAS

MEDICI SENZA FRONTIERE

ARTSEN ZONDER GRENZEN

LEGER UTEN GRENSER

ΓΙΑΤΡΟΙ ΧΩΡΙΣ ΣΥΝΟΡΑ

LĚKAŘI BEZ HRANIC

ÄRZTE OHNE GRENZEN

أطباء بلا حدود

